

***Detailed Office Action***

The communication dated 11/2/2011 has been entered and fully considered.

Claim 1 has been amended. Claims 7, 11-12 have been canceled. Claims 1-6, 8-9, and 13-30 are pending.

***Response to Arguments***

In light of amendment the 102 rejections based upon PEDERSON have been withdrawn. PEDERSON does not anticipate bi-functional substance different than the compatible polymerized monomer.

In light of amendment the rejections based upon GARNETT have been withdrawn. GARNETT does not disclose a bi-functional substance different than the compatible polymerized monomer.

In light of amendment the 102 rejections based upon BART have been withdrawn. BART does not anticipate using a different bi-functional substance and monomer.

*103 rejections based upon BART*

***Applicants argue that nothing in BART suggests using two separate substances in a two-step or multi-step process.***

The claims do not require the process to occur in two steps, multi-steps or sequentially. The bifunctional substance and monomer which are different can be added simultaneously according to instant claim 26.

BART discloses multiple conductive monomers can be used to form and conductive polymer bound to the fiber [column 3 lines 65-67]. In this case one monomer can be considered the bifunctional substance and the other monomer the monomer forming the conductive polymer.

*103 rejections based on PEDERSON*

***Applicant argues that PEDERSON does not disclose a multi-step or two step process.***

The claims do not require the process to occur in two steps, multi-steps or sequentially. The bifunctional substance and monomer which are different can be added simultaneously according to instant claim 26.

*BART in view of PEDERSON or PEDERSON in view of BART*

***Applicant argues that in the instant invention the chemical and enzymatic binding of the primer component to the fiber prior to polymerization provides a conductive fibrous material that cannot be achieved without the use of primer. The applicant argues that in BART the conductive polymer has been polymerized by chemical oxidation is simply in the form of a pigment that is spread mechanically onto the surface.***

BART states that the added monomer polymerizes onto the fiber and the concentration of the monomer is controlled such that further polymerization of the conductive polymer occurs on the fiber [column 8 lines 9-15]. Therefore BART explicitly teaches binding to the fiber. When two or more of the monomers disclosed in BART are used together, one may act as the bifunctional substance and the other as the monomer.

***Applicant argues that the monomers of PEDERSON are not conductive. The applicant argues that the monomers of BART are not conductive.***

PEDERSON discloses phenylendiamine whose polymer is conductive as evidenced by YANO. BART is explicitly to binding conductive polymers to lignocellulosic fibers.

112 2<sup>nd</sup> rejections

***The applicant maintains that in the present invention the laccase activity was determined using ABTS as a substrate at room temperature using a pH of 4.5. The applicant argues the specific conditions. The applicant asks for reconsideration of the rejection in view of evidentiary reference NIKU-PAAVULA.***

The applicant now argues that the laccase activity was determined using ABTS as a substrate, at room temperature and using a pH of 4.5. This conflicts with the applicant's previous arguments dated 12/08/2009 which stated that the specific condition is determined based upon the specific conditions of each chemical reaction [pg. 4 lines 1 and 2] and then even conflicts with the sentence in the current arguments "*The specific conditions of each chemical reaction are described in the working examples so that enzyme activity can be calculated in katal for each condition*". Either laccase activity is determined based upon a specific set of conditions or on varying conditions.

Further, the applicant's specification makes no mention of this newly defined method of determining laccase based upon ABTS at a pH of 4.5 and room temperature anywhere in the specification. Therefore the applicant fails to provide support for the first interpretation.

The applicant's argument that the determination of enzyme activity is based on each individual experiment is not supported by written description anywhere in the specification. Even giving the applicant this argument the claim would still be rejected based on 112 2<sup>nd</sup>. Since the applicant lists multiple conditions at which the reaction can take place [pg. 8 lines 4-12] and multiple reactants the claim language has no limit as to what 'nkat' can define as activity

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will change depending on different conditions as such 'nkat' is defined relatively. A claim term must be defined based on a standard that is recognizable to the person of ordinary skill in the art not a moving target.

The art (NIKKU\_PAAVOLA) provided by the applicant shows that an enzyme activity is defined at a specific temperature, with a specific substrate, at a specific pH, and specific time/substrate consumption [pg. 878 column 1 paragraph 1].

*ODP rejections*

The examiner withdraws the ODP rejection over 10/583711 the copending application doesn't claim a bifunctional substance different from a monomer that polymerizes into a conductive polymer.

The examiner withdraws the ODP rejection over 10/583712 the copending application doesn't claim a bifunctional substance different from a monomer that polymerizes into a conductive polymer. The copending application contacts a functional agent but does not claim that the functional agent is a monomer which polymerizes into a polymer

The examiner withdraws the ODP rejection over 10/583339 the copending application doesn't claim a bifunctional substance different from a monomer that polymerizes into a conductive polymer. The copending application contacts a polymer not a polymer formed by monomers while contacting the paper.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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1. Claims 2, 19 and 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As for claim 2, in independent claim 1, the applicant states that the bifunctional substance and the monomer are different [line 16]. However, in claim 2, the applicant states that 'the bifunctional monomers' are of *the* synthetic, electrically conductive polymer. Therefore in claim 2 the bi-functional substance and the monomer are the same. Therefore it is not clear if the applicant is attempting claim the bi-functional substance being the same or different from the monomers that make up the electrically conductive polymer.

Claims 19 and 27 are rejected based on the indefinite definition of nkat/g. The applicant still gives an undefined explanation for how this is calculated. This is in contrast to an art such as PEDERSON which specifically describes how to calculate the laccase enzyme activity in the publication:

*"(37) Laccase activity as defined herein is determined on the basis of spectrophotometric measurements of the oxidation of syringaldazin under aerobic conditions. The intensity of the violet colour produced in the oxidation reaction is measured at 530 nm.*

*(38) The analytical conditions are: 19 .mu.M syringaldazin, 23.2 mM acetate buffer, pH 5.5, 30.degree. C., reaction time 1 minute, shaking. 1 laccase unit (LACU) is the amount of enzyme that catalyses the conversion of 1 .mu.M of syringaldazin per minute under these conditions".*

In contrast the instant specification gives no applicable temperature, pH, time for acting or substrate which is acted upon.

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***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-6, 8, 9, 13, 15, and 21-26 are rejected under 35 U.S.C. 103(a) as obvious over U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART.

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As for claims 1, 2, 8, 9, and 15, BART discloses a process of treating a cellulosic pulp with an oxidant and a conductive polymer as to bond the conductive polymer to the cellulose fiber [abstract]. BART discloses the use of cellulosic fibers including high kappa fibers which contain phenolic structural groups [column 3 lines 53-55 and column 6 Table 1]. BART discloses treating the fibers with an oxidant to initiate polymerization including ammonium persulfate and ferric chloride [column 4 lines 5-9]. BART discloses the monomers acetylene, aniline, pyrrole, paraphenylene, and thiophene all of which have at least two functional groups [column 3 lines 65-67]. In addition to the above as for claim 8, aniline contains a benzene ring with a NH<sub>2</sub> group attached which the examiner has interpreted as a similar structural group to a substituted OH groups. Aniline is a benzene ring with a NH<sub>2</sub> group and phenol is a benzene ring with a hydroxyl group. In addition to the above as for claim 9, aniline has an amine functional group. Pyrrole has a secondary amine group.

The added monomer polymerizes onto the fiber and the concentration of the monomer is controlled such that further polymerization of the conductive polymer occurs on the fiber [column 8 lines 9-15]. In the teachings of BART the bi-functional substance and the monomer are the same.

However, BART discloses multiple conductive monomers can be used to form and conductive polymer bound to the fiber [column 3 lines 65-67]. If a person of ordinary skill in the art were to use a mixture of the monomer disclosed by BART then the monomer and bi-functional substance would be different. In some cases the first monomer would act as a bi-functional substance while the second monomer would bond to the first monomer and act as the conductive polymer. Conversely, the second monomer would also bond to the fiber while the

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first monomer would bond to the second monomer and act as the conductive polymer. It is *prima facie* obvious to combine equivalents known for the same purpose [see e.g. MPEP 2144.06 (I) Combining Equivalents Known for the Same Purpose].

As for claims 3, 4, 23 and 24, BART discloses the oxidation agent of ammonium persulfate [column 8 lines 20-25].

As for claim 5, BART discloses the consistency of 1.9 to 3.7% which falls within the instant claimed range [column 7 lines 10-14].

As for claim 6, BART discloses the conductive polymers of polyaniline and polypyrrole [column 8 lines 50-55]. BART also discloses the monomer acetylene and thiophene [column 7 lines 49-50]. The polymeric forms of these monomers are polyacetylene and polythiophene.

As for claim 13, BART discloses both low lignin chemical pulps and high lignin mechanical pulps [column 6 lines 55-62].

As for claims 21 and 22, BART discloses ammonium persulfate [column 4 lines 5-9]. Applicant states peroxide containing compounds are 'oxygen and oxygen containing compounds'. Ammonium persulfate is a peroxide compound and similarly releases oxygen.

As for claim 25, it is not clear the steps or the amount of radiation emitted onto the fiber, or consistency of the fiber. As paper web/pulp are subjected to light on a paper machine, at least some light radiation (including UV) strikes the pulp/paper web capable of oxidizing a phenol group. Examiner notes peroxide with ultraviolet light forms hydroxyl radicals, an advanced oxidation process.

As for claim 26, BART adds the bi-functional monomer and then adds the oxidizing agent [column 11, line 65 - column 12, line 10]. Examiner has interpreted the addition of the

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oxidant directly after the addition of the monomer/bi-functional agent, to be a simultaneous addition. The oxidized fiber is contacted with the bi-functional substance/monomer and the fiber is not oxidized until the oxidant is added the addition necessarily occurs simultaneously.

Alternatively, it would have been *prima facie* obvious to change the order of addition of the reactants [see e.g. MPEP 2144.04 (IV) (C) Changes in Sequence of Adding Ingredients].

1. Claims 14, 16-20, and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART, In view of U.S. Patent 6,187,136 PEDERSON, hereinafter PEDERSON.

As for claims 14 and 16-18, BART discloses that the bonding of the conductive polymers is accomplished by oxidation using a chemical oxidant [abstract]. BART discloses that other oxidants can be used to promote polymerization [column 8 lines 15-25]. BART does not disclose using an oxidative enzyme. PEDERSON discloses using enzymes such as laccase and oxidase to oxidize lignocellulosic materials [column 6 lines 1-35]. At the time of the invention it would have been *prima facie* obvious to substitute the chemical oxidant of BART for the enzymatic oxidant of PEDERSON. A person of ordinary skill in the art would be motivated to do so PEDERSON discloses that either chemical or enzymatic agents can be used to bind substances to lignocellulosic materials [column 1 lines 64-67]. It is *prima facie* obvious to substitute equivalents known for the same purpose [see e.g. MPEP 2144.06 (II) Substituting Equivalents Known for the Same Purpose]. In the instant case both chemical and enzymatic oxidants are known to graft chemicals onto lignocellulosic fibers. A person of ordinary skill in the art would expect the enzymes of PEDERSON to graft the monomers of BART onto the fiber.

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As for claims 19 and 27, PEDERSON discloses 0.0001 - 10mg/g of dry matter which is the instant claimed range [column 6 lines 60-67]. The applicant claims an enzyme dosage nkat/g (nanokatal/g) which the examiner has interpreted as an enzyme activity on pulp. However, the applicant does not state what the defined assay conditions this enzyme activity is measured. At different temperatures an enzyme can have different activities. Therefore the examiner cannot determine the proper metes and bounds of patent protection desired by the applicant.

PEDERSON discloses 0.02 LACU/g -2000 LACU/g [column 6 lines 40-47] of enzyme where an LACU is measured under disclosed conditions [column 6 lines 55-60]. PEDERSON additionally gives a specific point of 3 LACU/g which equals 50 nkat/g and falls with the instant claimed ranges of claims 22 and 40 [column 10 line 10].

Until shown otherwise the examiner has interpreted these ranges to overlap with the instant claimed ranges [since the applicant fails to define the units].

Alternatively, at the time of the invention it would have been obvious to optimize the enzyme activity on pulp [2144.05 (II) (B) Optimization of ranges and result effective variables].

PEDERSON clearly shows enzyme activity on pulp to be a result effective variable and therefore its optimization would have been obvious to a person of ordinary skill, absence evidence of unexpected results.

As for claims 20, 28, and 29 PEDERSON discloses the temperature range of 20-80 degrees C which is the instant claimed range, and discloses a pH of 4-9 which falls within the instant claimed range [column 8 lines 31 and line 48].

As for claims 21-24, PEDERSON discloses peroxide, a chemical oxidizing agent, can be used in combination with the enzyme [column 8 lines 4-10].

As for claim 30, BART discloses derivatives thereof [column 3 lines 54-67] but does not state any specific derivatives. PEDERSON discloses that derivatives such alkyl and alkoxy groups work on phenolic components and it would be expected that said derivative types would also work on aniline components [column 5 lines 13-20].

3. Claims 1-6, 8-10, and 13-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,187,136 PEDERSON et al., hereinafter PEDERSON, in view of U.S. Patent 5,211,810 BARTHOLOMEW et al., hereinafter BART.

As for claim 1, 2, 8-10, PEDERSON discloses a three step process where lignocellulose with phenolic groups is oxidized by way of an enzyme [abstract] and a bi-functional monomer is attached to the fiber [column 5 lines 13-50]. Subsequent to the bi-functional monomer being attached a strengthening agent including polyacrylate is added to the mixture [column 9 lines 5-10]. PEDERSON discloses phenylene diamine [column 9 lines 35-40] which has a plurality of functional groups including two second amine functional groups. Phenylene diamine contains a benzene ring with a NH<sub>2</sub> group attached which the examiner has interpreted as a similar structural group to a substituted OH groups. PEDERSON also discloses phenolic compounds with carboxylic acid groups and one or more phenolic groups [column 5 lines 9-50].

PEDERSON does not disclose adding the polyacrylate as a monomer and it is not clear if polyacrylate acts as a conductive polymer. BART discloses treating pulp with conductive monomers and with oxidative compounds [abstract]. At the time of the invention it would have been obvious to a person of ordinary skill in the art to follow the strengthening treatment of

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PEDERSON with the conductivity treatment of BART absence evidence of unexpected results.

A person of ordinary skill in the art would be motivated to do so to have paper with increased both the increased strength of PEDERSON and conductive properties of BART [abstract].

Further, the person of ordinary skill in the art would expect the modifier added onto the pulp by PEDERSON to help attract and retain monomers and polymers of BART.

As for claims 3, 4, 14 and 16-18, PEDERSON discloses using enzymes such as laccase and oxidase to oxidize lignocellulosic materials and modifying agents [column 6 lines 1-35].

As for claim 5, PEDERSON discloses a consistency of ~2% which falls within the instant claimed range [column 10 lines 14].

As for claim 6, BART discloses the conductive polymers of polyaniline and polypyrrole [column 8 lines 50-55]. BART also discloses the monomer acetylene and thiophene [column 7 lines 49-50]. The polymeric forms of these monomers are polyacetylene and polythiophene.

As for claim 13, PEDERSON discloses mechanical pulp [column 4 lines 57-67].

As for claims 15 and 26, PEDERSON discloses that the treatment can take place simultaneously or sequentially [column 4 lines 1-35].

As for claims 19 and 27, PEDERSON discloses 0.0001 - 10mg/g of dry matter which is the instant claimed range [column 6 lines 60-67]. The applicant claims an enzyme dosage nkat/g (nanokatal/g) which the examiner has interpreted as an enzyme activity on pulp. However, the applicant does not state what the defined assay conditions this enzyme activity is measured. At different temperatures an enzyme can have different activities. Therefore the examiner cannot determine the proper metes and bounds of patent protection desired by the applicant.

PEDERSON discloses 0.02 LACU/g -2000 LACU/g [column 6 lines 40-47] of enzyme where an

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LACU is measured under disclosed conditions [column 6 lines 55-60]. Until shown otherwise the examiner has interpreted these ranges to overlap with the instant claimed ranges [since the applicant fails to define the units]. PEDERSON additionally gives a specific point of 3 LACU/g which equals 50 nkat/g and falls with the instant claimed ranges of claims 22 and 40 [column 10 line 10].

Alternatively, at the time of the invention it would have been obvious to optimize the enzyme activity on pulp [2144.05 (II) (B) Optimization of ranges and result effective variables].

PEDERSON clearly shows enzyme activity on pulp to be a result effective variable and therefore its optimization would have been obvious to a person of ordinary skill, absence evidence of unexpected results.

As for claims 20, 28 and 29, PEDERSON discloses the temperature range of 20-80 degrees C which is the instant claimed range, and discloses a pH of 4-9 which falls within the instant claimed range [column 8 lines 31 and line 48].

As for claims 21-24, PEDERSON discloses peroxide, a chemical oxidizing agent, can be used in combination with the enzyme [column 8 lines 4-10].

As for claim 25, it is not clear the steps or the amount of radiation emitted onto the fiber, or consistency of the fiber. As paper web/pulp are subjected to light on a paper machine, at least some light radiation (including UV) strikes the pulp/paper web capable of oxidizing a phenol group. Examiner notes peroxide with ultraviolet light forms hydroxyl radicals, an advanced oxidation process.

As for claim 30, PEDERSON discloses that the bi-functional monomer can also be aromatic amines; aniline is an aromatic amines [column 9 lines 30-47]. The polymer of phenylene diamine [column 9 lines 35-40] is a derivative of aniline (one extra NH<sub>2</sub> group) and will form polyaniline derivative when radicalized. PEDERSON discloses that derivatives such alkyl and alkoxy groups work on phenolic components and it would be expected that said derivative types would also work on aniline components [column 5 lines 13-20].

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY CALANDRA whose telephone number is (571)270-5124. The examiner can normally be reached on Monday through Thursday, 7:30 AM-5:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Daniels can be reached on (571) 272-2450. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anthony J Calandra/  
Primary Examiner, Art Unit 1741